XMC-G460

Dual Display Graphics XMC module
with ATI E4690 GPU

User's Manual

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Recycled Paper

Advance Technologies; Automate the World.

Revision History

Revision	Release Date	Description of Change(s)
2.00	2010/11/09	Initial Release

Preface

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Using this Manual

Audience and Scope

The XMC-G460 User's Manual is intended for hardware technicians and systems operators with knowledge of installing, configuring and operating industrial grade computer systems.

Manual Organization

This manual is organized as follows:

Chapter 1, Introduction: Introduces the XMC-G460, its features, block diagrams, and package contents.

Chapter 2, Specifications: Presents detailed specification information.

Chapter 3, Board Interfaces: Describes the XMC-G460 connectors and switches.

Chapter 4, Getting Started: Describes the installation of the XMC-G460 to the carrier and driver installation.

Chapter 5, VBIOS Update: Provides information on how to update the XMC-G460 VBIOS.

Important Safety Instructions: Presents safety instructions all users must follow for the proper setup, installation and usage of equipment and/or software.

Getting Service: Contact information for ADLINK's worldwide offices.

Conventions

Take note of the following conventions used throughout this manual to make sure that users perform certain tasks and instructions properly.

NOTE:

Additional information, aids, and tips that help users perform tasks.

CAUTION:

Information to prevent ***minor*** physical injury, component damage, data loss, and/or program corruption when trying to complete a task.

WARNING:

Information to prevent ***serious*** physical injury, component damage, data loss, and/or program corruption when trying to complete a specific task.

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1 Introduction

1.1 Overview

The XMC-G460 is a Dual Display Graphics XMC module equipped with the ATI Radeon E4690 embedded graphics processor. Featured are one DVI-I and one DB-15 VGA port on the front panel with both RGB channels switchable to rear I/O, and one HDMI port to rear I/O. DirectX 10.1, OpenGL 3.x, and display resolutions up to 3840x2400 are supported. The ATI Radeon E4690 GPU features an integrated 128-bit memory interface and 512MB GDDR3 VRAM, 600MHz engine clock, 700MHz memory clock and dual independent display via VGA+VGA or VGA+DVI. For applications requiring reduced power consumption, the graphics engine clock can be lowered by VBIOS update. The XMC-G460 is compliant with the VITA 42.3 XMC standard and the PCI Express Base Specification Rev. 2.0.

1.2 Features

- Compliant with VITA 42.3 XMC standard
- Compliant with PCI Express Base Specification Rev. 2.0
- ATI Radeon E4690 embedded GPU
- Integrated 128-bit memory interface and 512MB GDDR3 VRAM
- 600MHz engine clock and 700MHz memory clock
- Supports DirectX 10.1 and OpenGL 3.x
- One DVI-I and one DB-15 VGA port on front panel
- Two RGB channels to front, switchable to rear via Pn4
- One HDMI port routed to rear via Pn4
- Supports display resolutions up to 3840x2400 per display output
- Supports dual independent display via VGA+VGA or VGA+DVI
- Changeable engine clock by VBIOS update

1.3 Block Diagram

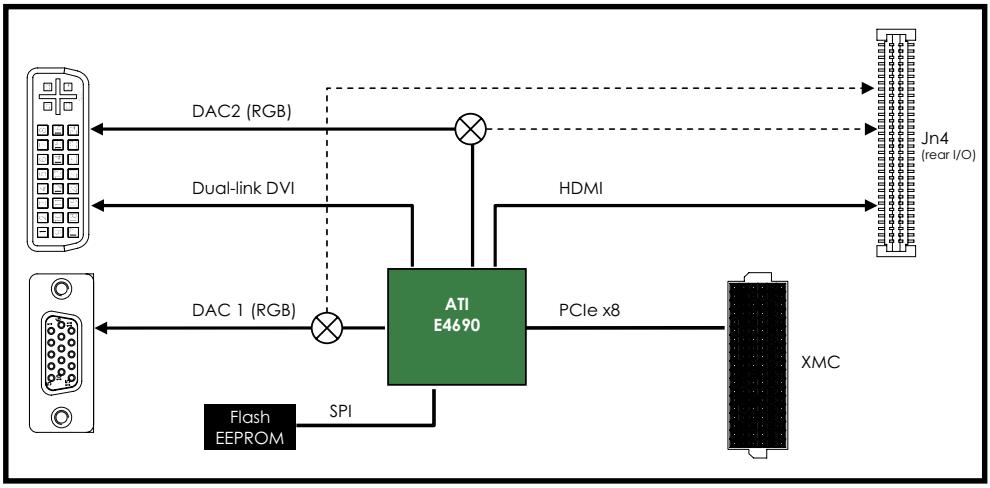

Figure 1-1: XMC-G460 Functional Block Diagram

1.4 Package Contents

The XMC-G460 is packaged with the following components. If any of the items on the contents list are missing or damaged, retain the shipping carton and packing material and contact the dealer for inspection. Please obtain authorization before returning any product to ADLINK.

- XMC-G460 module
- DVI to VGA adapter connector
- ADLINK All-in-One DVD
- User's manual

This product must be protected from static discharge and physical shock. Never remove any of the components except at a static-free workstation. Use the anti-static bag shipped with the product when putting the board on a surface. Wear an anti-static wrist strap properly grounded on one of the system's ESD ground jacks when installing or servicing system components.

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2 Specifications

2.1 XMC-G460

Standards	• VITA 42.3-2006 • VITA 20-2001
Form Factor	• IEEE P1386, Standard XMC.3 • 74 mm x 149 mm x 8.2 mm (single width)
GPU	• ATI Radeon E4690 embedded GPU • Integrated 128-bit memory interface and 512MB GDDR3 VRAM • Compliant with PCI Express Base Specification Rev. 2.0
Interface	• Supports PCI Express x1, x4, x8 lanes
Display	• Two DAC channels to one DB-15 VGA port and one DVI-I port, both switchable to rear • One dual link DVI port on front panel via DVI-I connector • One HDMI port routed to rear
OS Compatibility	• Microsoft Windows XP Professional • Microsoft Windows XP x64 Edition • Microsoft Windows 7 • Red Hat Enterprise Linux 5.3 x86_64 • Other OS support upon request
Environmental	• Operating Temperature: 0 to 55°C with forced air flow[1] • Storage Temperature: -40°C to 85°C • Humidity: 95%@60°C non-condensing • Shock: 15G peak-to-peak, 11ms duration, non-operating • Vibration: Operating 2Grms, 5-500Hz
EMI	• CE EN55022 • FCC Class A

Notes:

1. ADLINK-certified thermal design. The thermal performance is dependent on the chassis cooling design. Sufficient forced air-flow is required (see “Thermal Requirements” on page 8).

2.2 GPU

The following sections describe the ATI Radeon E4690 embedded GPU features and functions.

- Integrated 512MB GDDR3 and 128-bit memory interface
- Fully DirectX 10.1 compliant
- Support for OpenGL® 3.0
- Dual independent display controllers support true 30-bpp throughout the display pipe
- Support for display resolutions up to 3840x2400 per display output
- Integrated HD Audio codec supports linear PCM and Dolby® Digital (7.1) audio formats for HDMI
- Dual RGB output
- Maximum pixel frequency of 400 MHz for RGB
- Fully compliant with PCI Express Base Specification Rev. 2.0.
- Supports PCI-Express x1, x2, x4, x8, and x16 lane widths.
- Full ACPI 1.0b, OnNow, and IAPC (Instantly Available PC) power management.

2.3 Power Consumption

The power consumption data of the XMC-G460 was measured using 3D Mark06 at different engine clock frequencies (memory clock fixed at 700MHz).

Configuration					
Futuremark 3DMark06 Professional Edition 1.1.0					
Engine Clock	Voltage (V)	Current (A)		Power (W)	
		Max(1)	Mean(2)	Max	Mean
600	+5 V	6.08	3.31	30.4	16.6
500	+5 V	4.80	2.67	24.0	13.3
400	+5 V	3.84	2.18	19.2	10.8
300	+5 V	2.96	1.66	14.8	8.30
200	+5 V	1.92	1.16	9.60	5.79

Table 2-1: XMC-G460 Power Consumption

Notes:

1. The maximum measured current while running 3D Mark06.
2. The average measured current while running 3D Mark06.

2.4 Thermal Requirements

This section provides information on the thermal requirements of the XMC-G460. Cooling of the board and its components is provided by the thermal module (passive heatsink) and is dependent on sufficient airflow from the chassis.

The amount of thermal energy that can by dissipated from the board is dependent on the ambient air temperature, power consumption of the host board, and the airflow rate of the chassis. To provide the user with guidelines for the upper limits of operating conditions for the XMC-G460, the following sections give information on the maximum ambient air temperature as a function of airflow rate for a given level of power consumption with the XMC-G460 installed on a cPCI-6510 6U CompactPCI Processor Blade.

Power Dissipation Graphs

The graphs shown below illustrate the level of GPU power dissipation that can be maintained dependent on ambient air temperature and airflow rate. Graphs are provided for 400MHz and 600MHz engine clock rates supported by the XMC-G460. The curves on each graph indicate the upper limits of operating conditions under which the GPU will remain below its maximum $T_{junction}$ when running 3D Mark 06 at a given percentage of the GPU's thermal design power (TDP).

Graphics output will stop when the GPU temperature exceeds the maximum junction temperature ($T_{j,Max}$=125°C). When the ambient air temperature and airflow rate are in the ranges below the TDP curves on the graphs, the GPU temperature will remain below $T_{j,Max}$ and the GPU will be able to operate safely.

The power dissipation graphs show two curves:

- 100% TDP
- 75% TDP

400MHz Engine Clock

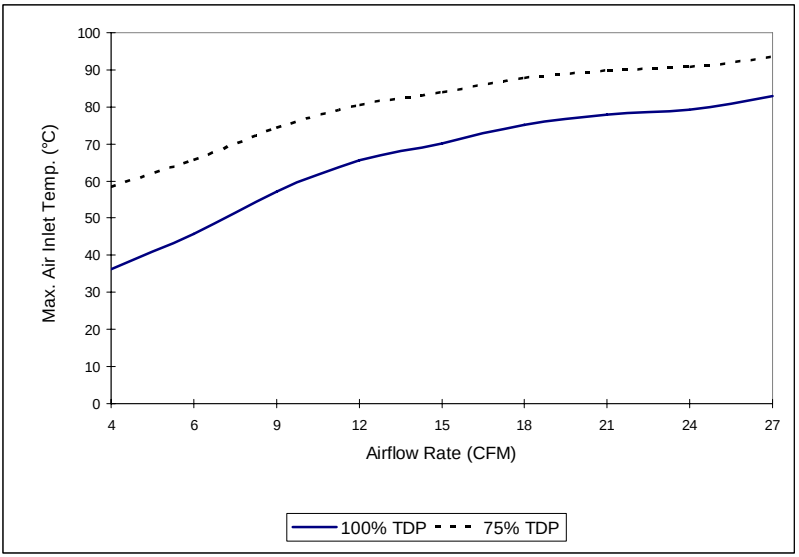


Figure 2-1: XMC-G460 Power Dissipation Graph (400MHz engine clock)

600MHz Engine Clock

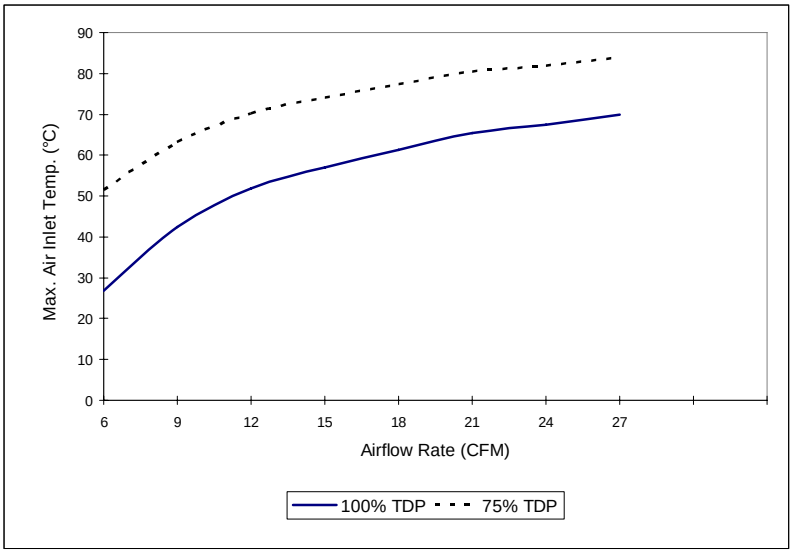


Figure 2-2: XMC-G460 Power Dissipation Graph (600MHz engine clock)

2.5 Graphics Performance

Futuremark 3DMark06 Professional Edition 1.1.0 was used to measured the graphics performance of the XMC-G460 while installed on an ADLINK cPCI-6510 6U CompactPCI Processor Blade. The below table shows the test configuration and results at different engine clock speeds.

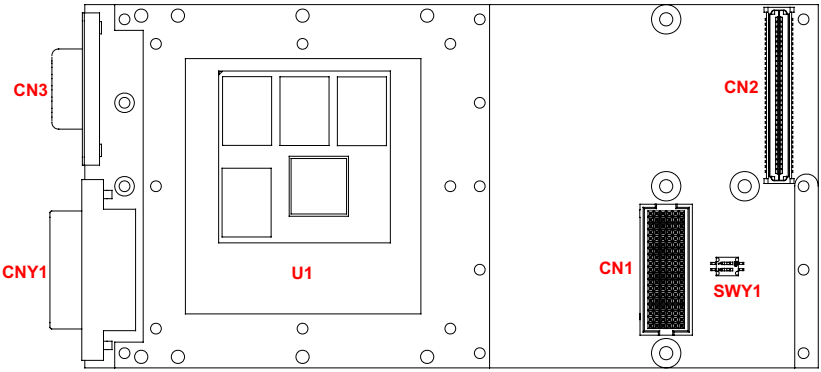
Test Configuration					
SBC	ADLINK cPCI-6510 Rev. A2				
CPU	Intel® Core™ i7-610E Processor (4M Cache, 2.53 GHz)				
RAM	Onboard Dual Channel DDR3 1066 MHz 2GB				
Resolution	1280x1024				
OS	Microsoft Windows XP Professional SP3				
Benchmark	**Clock Speed (MHz)**		**Score**		
	Engine	**Memory**	**SM2.0**	**HDR/SM3.0**	**3DMark**
3DMark 06	600	700	2204	2670	6303
	500	700	2034	2462	5869
	400	700	1788	2181	5249
	300	700	1445	1793	4365
	200	700	974	1207	3021
	100	700	489	606	1562

Table 2-2: XMC-G460 Graphics Performance

3 Board Interfaces

This chapter illustrates the board layout, connector pin assignments, and switch settings to familiarize users with the XMC-G460.

3.1 XMC-G460 Board Layout



U1	E4690 GPU	**CN3**	DB-15 VGA connector
CN1	XMC connector	**CNY1**	DVI-I connector
CN2	Jn4 Rear I/O connector	**SWY1**	RGB output switch

Figure 3-1: XMC-G460 Board Layout

3.2 Connector Pin Assignments

DB-15 VGA Connector (CN3)

Signal Name	Pin #	Pin #	Signal Name
Red	1	2	Green
Blue	3	4	N.C.
GND	5	6	GND
GND	7	8	GND
+5V.	9	10	GND
N.C.	11	12	CRTDATA
HSYNC	13	14	VSYNC
CRTCLK	15		

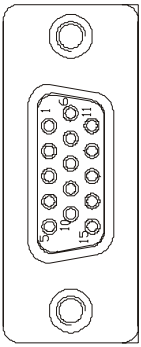
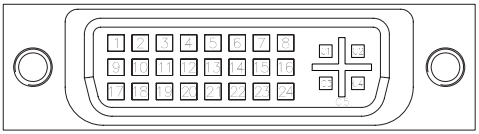


Table 3-1: VGA Connector Pin Definition

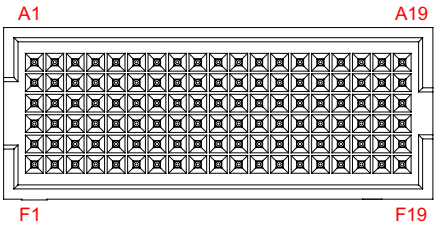
DVI-I Connector (CNY1)



Pin #	Signal	Pin #	Signal
1	TMDS Data2-	16	Hot Plug Detect
2	TMDS Data2+	17	TMDS Data0-
3	GND	18	TMDS Data0+
4	NC	19	GND
5	NC	20	TMDS Data5-
6	DDC Clock [SCL]	21	TMDS Data5+
7	DDC Data [SDA]	22	TMDS Clock Shield
8	Analog vertical sync	23	TMDS Clock +
9	TMDS Data1-	24	TMDS Clock -
10	TMDS Data1+	C1	Analog Red
11	GND	C2	Analog Green
12	NC	C3	Analog Blue
13	NC	C4	Analog Horizontal Sync
14	+5 V Power	C5	Analog GND Return
15	GND		

Table 3-2: DVI-I Connector Pin Definition

XMC Connector (CN1)



Pin#	A	B	C	D	E	F
1	PET0p0	PET0n0	3.3V	PET0p1	PET0n1	VPWR
2	GND	GND	Reserved	GND	GND	MRSTI#
3	PET0p2	PET0n2	3.3V	PET0p3	PET0n3	VPWR
4	GND	GND	Reserved	GND	GND	Reserved
5	PET0p4	PET0n4	3.3V	PET0p5	PET0n5	VPWR
6	GND	GND	Reserved	GND	GND	+12V
7	PET0p6	PET0n6	3.3V	PET0p7	PET0n7	VPWR
8	GND	GND	TDI	GND	GND	+12V
9	NC	NC	NC	NC	NC	VPWR
10	GND	GND	TDO	GND	GND	Reserved
11	PER0p0	PER0n0	Reserved	PER0p1	PER0n1	VPWR
12	GND	GND	Reserved	GND	GND	MPRESENT#
13	PER0p2	PER0n2	Reserved	PER0p3	PER0n3	VPWR
14	GND	GND	Reserved	GND	GND	Reserved
15	PER0p4	PER0n4	N.C.	PER0p5	PER0n5	VPWR
16	GND	GND	Reserved	GND	GND	Reserved
17	PER0p6	PER0n6	N.C.	PER0p7	PER0n7	N.C.
18	GND	GND	N.C.	GND	GND	N.C.
19	REFCLK+0	REFCLK-0	N.C.	N.C.	N.C.	N.C.

Table 3-3: XMC Connector Pin Definition

Jn4 Rear I/O Connector (CN2)

Pin#	Signal	Pin#	Signal
1	Reserved	33	BLU-2 RTN
2	Reserved	34	BLU-2
3	Reserved	35	H-SYNC-2
4	Reserved	36	Reserved
5	Reserved	37	V-SYNC-1
6	Reserved	38	RED-2 RTN
7	Reserved	39	RED-2
8	Reserved	40	V-SYNC-2
9	DDCHDMI-SDA	41	DDC2-SDA
10	DDCHDMI-SCL	42	H-SYNC-1
11	HDMI HPD	43	DDC2-SCL
12	DDC1-SDA	44	Reserved
13	DDC1-SCL	45	GND
14	Reserved	46	GND
15	Reserved	47	GRN-1 RTN
16	Reserved	48	RED-1 RTN
17	Reserved	49	GRN-1
18	Reserved	50	RED-1
19	Reserved	51	TX0P
20	Reserved	52	TXCP
21	Reserved	53	TX0N
22	DDCHDMI-SDA	54	TXCN
23	DDCHDMI-SCL	55	GND
24	HDMI HPD	56	GND
25	DDC1-SDA	57	TX1P
26	DDC1-SCL	58	TX2P
27	Reserved	59	TX1N
28	Reserved	60	TX2N
29	Reserved	61	GRN-2 RTN
30	Reserved	62	BLU-1 RTN
31	Reserved	63	GRN-2
32	Reserved	64	BLU-1

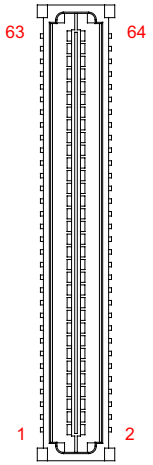


Table 3-4: Jn4 Rear I/O Connector Pin Definition

3.3 Switch Settings

RGB Output Switch (SWY1)

The XMC-G460 has a switch to set the DAC channel outputs (RGB) to front or rear. The default setting is both channels to the front panel.

Mode	1	2
DAC1 to front DB-15 VGA DAC2 to front DVI-I	OFF	OFF
DAC1, 2 to rear	ON	ON
DAC1 to front DB-15 VGA DAC2 to rear	OFF	ON
DAC1 to rear DAC2 to front DVI-I	ON	OFF

Table 3-5: RGB Output Switch Settings

4 Getting Started

4.1 Installing the Module

1. Remove the XMC slot filler faceplate from the front panel of the host board.
2. Insert the faceplate of the XMC module into the XMC slot in the front panel of the host board.
3. Carefully align the male connectors of the XMC module (component-side down) to the female connectors of the host board and firmly press down.
4. Secure the XMC module with the four screws provided from the bottom side of the host board.

4.2 Driver Installation

The XMC-G460 drivers can be found on the ADLINK All-In-One DVD at **X:\XMC\XMC-G460\GPU**, or at the ADLINK website (**http://www.adlinktech.com**). Driver installation procedures for Windows® XP are described below.

1. Install the Windows operating system before installing any driver. Most standard I/O device drivers are installed during Windows installation.
2. Install the graphics driver by running the file **Setup.exe** at **...\GPU\ ATI_Graphics_Adapter_WinXP_8.660.0.0**

We recommend using the drivers provided on the ADLINK All-in-One DVD or downloaded from the ADLINK website to ensure compatibility.

5 VBIOS Update

For thermal considerations, the engine clock of the XMC-G460 can be changed by applying a VBIOS update. ADLINK provides four VBIOS options (200, 300, 400, 500MHz) for users to set the best performance and thermal combination for their application. The VBIOS updates can be found on the All-In-One DVD at **X:XMC\XMC-G460\VBIOS**, or at the ADLINK website (**http://www.adlinktech.com**). Follow the steps below to update the VBIOS.

1. Create a DOS bootable USB flash drive.
2. Copy the Pxxx.bat provided on the All-In-One DVD or ADLINK website to the root directory ("xxx" indicates the engine clock frequency).
3. Boot the system from the USB flash drive.
4. Run Pxxx.bat to update the VBIOS.

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Important Safety Instructions

For user safety, please read and follow all **instructions**, **WARNINGS**, **CAUTIONS,** and **NOTES** marked in this manual and on the associated equipment before handling/operating the equipment.

- Read these safety instructions carefully.
- Keep this user's manual for future reference.
- Read the specifications section of this manual for detailed information on the operating environment of this equipment.
- When installing/mounting or uninstalling/removing equipment:
  - Turn off power and unplug any power cords/cables.
- To avoid electrical shock and/or damage to equipment:
  - Keep equipment away from water or liquid sources;
  - Keep equipment away from high heat or high humidity;
  - Keep equipment properly ventilated (do not block or cover ventilation openings);
  - Make sure to use recommended voltage and power source settings;
  - Always install and operate equipment near an easily accessible electrical socket-outlet;
  - Secure the power cord (do not place any object on/over the power cord);
  - Only install/attach and operate equipment on stable surfaces and/or recommended mountings; and,
  - If the equipment will not be used for long periods of time, turn off and unplug the equipment from its power source.

- Never attempt to fix the equipment. Equipment should only be serviced by qualified personnel.

A Lithium-type battery may be provided for uninterrupted, backup or emergency power.

Risk of explosion if battery is replaced with one of an incorrect type. Dispose of used batteries appropriately.

- Equipment must be serviced by authorized technicians when:
  - The power cord or plug is damaged;
  - Liquid has penetrated the equipment;
  - It has been exposed to high humidity/moisture;
  - It is not functioning or does not function according to the user's manual;
  - It has been dropped and/or damaged; and/or,
  - It has an obvious sign of breakage.

Getting Service

Contact us should you require any service or assistance.

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